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Drop-Box Technique for Quantitative Sampling of Macrofauna and Aquatic Plants at Restored and Natural Wetlands

J. Douglas Oliver
Liberty University, doliver@liberty.edu

Andrew J. Leslie

William M. Bartodziej

In the future, I would like to try planting different native species from the area. Based on studies (Amaranthus and Perry 1987, Perry *et al* 1989), which found that in clearcuts on granitic soils inoculated tree seedlings experience better survival than do uninoculated seedlings, I would also like to inoculate some of the native seedlings with mycorrhyzal fungi to determine if their survival would improve on this harsh site.

References

Amaranthus, M. P. and D. A. Perry. 1987. The effect of soil transfers on ectomycorrhizal formation and the survival and growth of conifer seedlings on old, non-reforested clearcuts. *Canadian Journal of Forest Research* 17:944-950.

Perry, D. A., M. P. Amaranthus, and J. G. Borchers. 1989. Bootstrapping in ecosystems. *Bioscience* 39:230-237.

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149 FROM: Abstracts of the 52nd Midwest Fish and Wildlife Conference.

149.1 Reclaiming Savanna-Shrub Openings Utilizing Herbicide Injection in Missouri's Ozark Forest. Paper 231. Jensen, R. G., E. P. Wiggers, School of Natural Resources, University of Missouri, Columbia, MO 65211; and E. Kurzejeski.

Tordon 101R killed 85 percent of the unwanted vegetation in shrub openings, while Roundup eliminated 77 percent. These researchers found both herbicides effective, cost efficient, selective, and useful in areas where cutting or chopping was impractical.

149.2 Effects of Beaver Browsing on Boreal Forest Composition. Paper 179. Johnston, C. A., Natural Resources Research Institute, University of Minnesota-Duluth, Duluth, MN 55811; and R. J. Naiman.

Herbivory by beavers (*Castor canadensis*) decreased the relative importance of trembling aspen (*Populus tremuloides*) and increased the importance of red-tag alder (*Alnus rugosa*) and white spruce (*Picea glauca*). This suggests the effects this animal may have had on the composition and successional tendencies of the pre- settlement forests.

150 Selection of Seedlings during Oak Woodland Restoration. 1991 SER Conference. Scott, T. A. and N. L. Pratini, Integrated Hardwood Range Management Program, Dept. of Earth Sciences, University of California, Riverside, CA 92521.

This study of two species of western oak—the Engelmann oak (*Quercus Engelmannii*) and coast live oak (*Q. agrifolia*)—implies that planting abundant numbers of acorns will overcome seed variability and differing environmental conditions at restoration sites and is a more important consideration than the stamina of individual seedlings.

151 FROM: Wiregrass Biology and Management: Maintaining Groundcover Integrity in Longleaf Pine Ecosystems.

151.1 Fire Ecology of Southeastern Longleaf Pine Savannas. Platt, W. J., Dept. of Botany, Louisiana State University, Baton Rouge, LA 70803.

A ten-year study conducted in the xeric sandhills and seasonally- flooded flatwoods of the St. Marks National Wildlife Refuge in northern Florida demonstrated that prescribed burns during the early part of the growing season (April through May) were most beneficial to the flowering and seed production of grasses and forbs. Pyrogenic grasses, such as wiregrass (*Aristida stricta*) and little bluestem (*Schizachyrium scoparium*), along with longleaf pine (*Pinus palustris*) were found to play key roles in maintaining a savanna habitat.

152 FROM: The Oak Resource in the Upper Midwest: Implications for Management.

152.1 Role of Fire in Maintaining Oaks in Mesic Oak-Maple Forests. pp. 27-33. Will-Wolf, S., Dept. of Botany, Birge Hall, University of Wisconsin-Madison, Madison, WI 53706-1381.

Results of this experiment carried out in Baxter Hollow, a 1500 hectare valley in the Baraboo Hills in south-central Wisconsin, indicate that prescribed burns alone will not promote oak regeneration in a mesic oak-maple forest. However, when combined with other techniques, such as girdling of unwanted species and planting of oaks, fire can aid oak regeneration.

152.2 The Quality of Oak Seedlings Needed for Successful Artificial Regeneration in the Central States. pp. 180-186. Schultz, R. C. and J. R. Thompson, Dept. of Forestry, Iowa State University, Ames, IA 50011.

Tests conducted by the Hardwood Nursery Cooperative indicate that one-year old seedlings of red oak (*Quercus rubra*) should be nearly 35 cm tall, with a root collar diameter of six mm and, most importantly, six or more permanent first-order lateral roots in order to ensure survival after outplanting. Nurseries should reduce bed density to 60 seedlings per square meter and undercut seedlings before lifting them in order to increase the number of permanent first-order root laterals.

153 FROM: Endangered Plant Communities of Southern California.

153.1 The Status of Walnut Forests and Woodlands (*Juglans californica*) in Southern California. pp. 42-54. Quinn, R. D., Dept. of Biological Sciences, California State Polytechnic University, Pomona, CA 91768.

Quinn describes the distribution, composition, phenology, fire ecology, and animal communities of California walnut woodlands, a rapidly disappearing community type. While information about the management of this community is limited, the author points out that management will be a moot point unless these woodlands are protected from urbanization.

154 Prescription for Dogwoods. Anon. 1991. *The Avant Gardener* 23(9):1.

Cooperative studies by the U. S. Forest Service, the University of Georgia, and the University of Tennessee indicate that dogwood anthracnose, which has devastated many flowering dogwoods (*Cornus florida*) in the higher elevations of the Southeast, can be abated by mulching, removing dead twigs and water sprouts, and pruning surrounding trees to allow more light to reach the dogwoods.

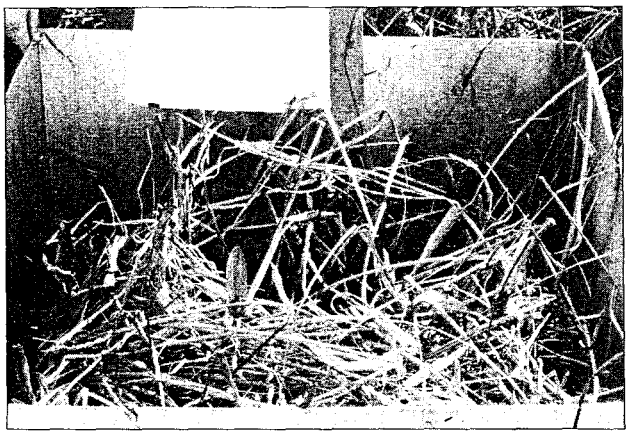
Wetlands

155 Drop-box Technique for Quantitative Sampling of Macrofauna and Aquatic Plants in Restored and Natural Wetlands (Florida)

J. Douglas Oliver, Andrew J. Leslie and William M. Bartodziej, Bureau of Aquatic Plant Management, Florida Department of Natural Resources, Tallahassee, FL 32399 (904) 487-2600 FAX 488-1254

Methods used to assess the success of restored wetlands are often qualitative and without statistical rigor. We recommend that more research studies include quantitative estimates of macrofauna and aquatic plants per unit area of wetland, and suggest a possible method for such studies.

Adopted from previous work on Okefenokee Swamp on the Georgia- Florida border (Freeman *et al.*, 1984; Greening and Gerritsen 1987; Oliver and Schoenberg 1989), the method we outline here requires two workers to carry a one m^2 stainless steel box, which is open at the top and bottom, through the marsh in a random direction for a random distance whereupon they drop it into the herbaceous



Wetland researchers drop the one m^2 stainless steel box in the wetland and prepare to sample vegetation and macrofauna.

Photo by Douglas Oliver

vegetation as shown in Figure 1. They then uproot all aquatic plants within the box, and shake them inside the sampler to remove attached macroinvertebrates. They place the plants in plastic bags on ice for later identification and weight measurements.

If standing water is present, workers sweep the inside of the sampler with a hand-held 1.5 mm mesh net until 10 consecutive passes capture no vertebrates or macroinvertebrates. Any fish or macroinvertebrates are then collected and preserved in formalin for later identification and weighing. The netting also collects suspended detritus and uprooted vegetation, which are preserved in formalin and stained with Rose Bengal. Laboratory workers later pick the stained macrofauna out of these additional samples. An advantage of such sampling is that the sampled fish and/or macroinvertebrates come from the same square-meter areas as the vegetation, making it possible to determine ecosystem-level associations among biotic (and physico-chemical) elements.

Results from marsh sites in Okefenokee Swamp indicated that performing about eight replicate samples provided enough data to obtain statistically significant differences in fish densities at otherwise apparently similar sites (Oliver and Schoenberg, 1989). On the other hand, we needed only three samples to establish significant statistical differences in plant densities. Sampling fish and plants in this manner required about 12 hours in the field, and about 38 hours of laboratory analysis per site.

We have applied this method to restored and natural wetlands in the phosphate-mining district of central Florida. Our assessments there include two former mine sites that were planted with aquatic plants in the spring of 1990. The first site, to which marsh muck was added (HM), is situated less than one km away from the unmucked site (HU).

To check the merit of our sampling method for restoration studies, we used it to compare densities of small marsh fishes at HM and at HU in January, 1991. We found that there were higher total numbers of fish in HM than in HU (Mann-Whitney U = 64, $n_1 = n_2 = 8$, $P < 0.001$). We also compared the total dry biomass of live plants at the two sites during the same period of time. Contrary to our expectations, HM had less vegetation than HU at that date (t_1 tail, 4 df = 4.12, $P < 0.01$). However this difference occurred because two exotic species were abundant at HU but absent at HM.

Thus the box sampler works well for statistical comparison of densities of macrofauna and macroflora in shallow herbaceous wetlands, including restored wetlands. However, the method is very time-consuming and may be too much work and therefore too expensive for routine evaluations of wetlands by either regulators or environmental consultants. Instead, we use and recommend such sampling only for in-depth investigations of herbaceous restored and reference marshes. For general evaluation of restoration success, we are looking for a parameter that correlates well enough with the highly replicated sampling described above.

We have not tested this method at saltwater or estuarine restoration sites. We suspect, however, that it should work on such sites if the sampled area is reasonably flat, soft-bottomed and dominated by herbaceous vegetation.

References

Freeman, B.J., H.S. Greening, and J.D. Oliver. 1984. Comparison of three methods for sampling fishes and macroinvertebrates in a vegetated freshwater wetland. *Journal of Freshwater Ecology* 2:603-609.

Greening, H.S., and J. Gerritsen. 1987. Changes in macrophyte community structure following drought in the Okefenokee Swamp, Georgia, USA. *Aquatic Botany* 28:113-128.

Oliver, J.D. and S.A. Schoenberg. 1989. Residual influence of macronutrient enrichment on the aquatic food web of an Okefenokee Swamp abandoned bird rookery. *Oikos* 55:175-182.

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156 FROM: Abstracts of the 52nd Midwest Fish and Wildlife Conference.

156.1 A Comparison of Bird-Use and Aquatic Invertebrate Communities Between Restored and Natural Prairie Wetlands in Northern Iowa. Paper 309. Delphey, P. J. and J. J. Dinsmore, Dept. of Animal Ecology, Iowa State University, Ames, IA 50011.

After studying nine restored and five natural wetlands in 1989, and 12 restored and eight natural wetlands in 1990, Delphey and Dinsmore concluded that natural wetlands contained significantly more invertebrates than did restored wetlands. The relatively simple vegetative structure of restored wetlands made them less attractive to a wide diversity of birds, although waterfowl and migrating shorebirds were found throughout restored sites.

156.2 Marsh Bird Responses to Restored Wetlands. Paper 254. Hemesath, L. M. and J. J. Dinsmore, Dept. of Animal Ecology, Iowa State University, Ames, IA 50011.

A study of wetlands restored under the Conservation Reserve Program revealed that a number of marsh bird species quickly colonize these new habitats. It appears, however, that some species including the Black Tern (*Childonias nigra*) and the Virginia Rail (*Rallus limicola*), only inhabit larger restoration sites.